

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY15 Final Performance Report
Due date: July 15, 2016**

Cover Page

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Fiscal Year:	2015
USDA-ARS Agreement ID:	59-0206-4-013
USDA-ARS Agreement Title:	Development of Hard Spring Wheat Cultivars Resistant Scab Disease.
FY15 USDA-ARS Award Amount:	\$ 114,565
Recipient Organization:	North Dakota State University Office of Grant & Contract Accounting NDSU Dept 3130, PO Box 6050 Fargo, ND 58108-0650
DUNS Number:	80-388-2299
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Recipient Identifying Number or Account Number:	FAR0022046
Project/Grant Reporting Period:	05/05/15-05/04/16
Reporting Period End Date:	05/04/16

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
VDHR-SPR	Development of Hard Spring Wheat Cultivars Resistant Scab Disease.	\$ 114,565
	FY15 Total ARS Award Amount	\$ 114,565

Principal Investigator

Date

* MGMT – FHB Management
 FST – Food Safety & Toxicology
 GDER – Gene Discovery & Engineering Resistance
 PBG – Pathogen Biology & Genetics
 EC-HQ – Executive Committee-Headquarters
 BAR-CP – Barley Coordinated Project
 DUR-CP – Durum Coordinated Project
 HWW-CP – Hard Winter Wheat Coordinated Project
 VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Soft Winter Wheat Region
 SWW – Southern Soft Red Winter Wheat Region

Project 1: *Development of Hard Spring Wheat Cultivars Resistant Scab Disease.*

1. What are the major goals and objectives of the project?

The specific objectives of this project are to: 1) continue developing adapted HRSW cultivars that have improved resistance to FHB and DON accumulation, combined with good agronomic and end-use quality attributes; 2) identify and introgress novel FHB resistance that reduces disease infection and DON levels into the adapted HRSW germplasm base; and 3) use novel tools such as molecular markers to facilitate identification of FHB resistant genotypes.

2. What was accomplished under these goals?

1) major activities

- HRSW breeding program activities included nurseries and yield trials conducted at seven ND and two western MN locations for agronomic performance, disease resistance, and end-use quality traits
- The winter nurseries in AZ, PR, and New Zealand were used for generation advancement, selection, and seed increase.
- The inoculated field nurseries at Prosper, Carrington, and Langdon, ND. In total, we evaluated 3,000 hill plots at Carrington and Langdon, and 12,900 hill plots for FHB resistance in mist-irrigated and inoculated nurseries. We submitted 1,020 lines to the U of MN DON testing laboratory and 1,986 lines to the NDSU DON testing laboratory.
- About 614 new crosses were made to incorporate favorable genes for agronomic performance, disease resistance, and end-use quality. We evaluated 545 F2 populations and 38,000 F3 to F5 families in 2 ND field locations. We evaluated 1,600 F6 to F10 lines in replicated yield trials at up to 7 locations. Selected lines were evaluated for end-use quality in the NDSU wheat quality laboratory of Dr. Senay Simsek, for FHB resistance by Dr. Shaobin Zhong.

2) specific objectives

- Breeding lines were identified with improved FHB resistance and reduced DON accumulation.
- Crosses were made to incorporate improved FHB resistance.
- Lines were submitted to Dr. Shiaoman Chao's USDA-ARS laboratory for molecular marker genotyping.

3) significant results

- Eighteen lines, including five Clearfield resistance lines were tested in the HRSW statewide trials. Reduced FHB and DON accumulation were important traits for advancing lines to these trials.
- Two lines were entered in the Wheat Quality Council trials. Reduced FHB and DON accumulation were important traits for advancing lines to these trials.
- Five lines were entered in the Uniform Regional Spring Nursery (URSN)-FHB and HRSW URSN. Reduced FHB and DON accumulation were important traits for advancing lines to these trials.

4) key outcomes or other achievements

- ND 825 was approved for pre-release by the ND Agricultural Experiment Station. ND 825 has similar FHB resistance as Glenn.
- Dr. Mohamed Mergoum resigned as the HRSW breeder in September 2015 to take a job at the University of Georgia.
- Dr. Andrew Green has been hired to refill to Dr. Mergoum's position and will begin in June 2016.

3. What opportunities for training and professional development has the project provided?

- Ahmed ElFatih El Doliefy completed his PhD on Molecular Mapping of Fusarium head blight resistance in two adapted spring wheat cultivars. Dr. El Doliefy returned to Egypt to teach at a university in Cairo.
- Sepehr Mohajeri Naraghi, a graduate student from Iran, is working on his PhD on identification of molecular markers associated with wheat quality in ND germplasm.
- Hisam Rabbi, a graduate student from Bangladesh, is working on his PhD on identification of molecular markers associated with agronomics and end-use quality in ND wheat germplasm.
- John Grieger is an MS student from North Dakota that is working on a project to identify molecular markers associated with leaf rust resistance in ND wheat germplasm.

4. How have the results been disseminated to communities of interest?

Results are disseminated via articles in peer-reviewed journals and popular press, field day presentations, and presentations to stakeholder groups at local and regional meetings.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY15 award period. The term “support” below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student’s stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

- 1. Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY15 award period? No**

If yes, how many?

- 2. Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY15 award period? Yes**

If yes, how many? 1

- 3. Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant taken faculty positions with universities? No**

If yes, how many?

- 4. Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies? No**

If yes, how many?

Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY15 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.*

Name of Germplasm/Cultivar	Grain Class	FHB Resistance (S, MS, MR, R, where R represents your most resistant check)	FHB Rating (0-9)	Year Released

Add rows if needed.

NOTE: List the associated release notice or publication under the appropriate sub-section in the ‘Publications’ section of the FPR.

Abbreviations for Grain Classes

- Barley - BAR
- Durum - DUR
- Hard Red Winter - HRW
- Hard White Winter - HWW
- Hard Red Spring - HRS
- Soft Red Winter - SRW
- Soft White Winter - SWW

Publications, Conference Papers, and Presentations

Refer to the FY15-FPR_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Jonathan T. Eckard, Karl D. Glover, **Mohamed Mergoum**, James A. Anderson and Jose L. Gonzalez-Hernandez. **2015**. Multiple Fusarium head blight resistance loci mapped and pyramided onto elite spring wheat *Fhb1* backgrounds using an IBD-based linkage approach. **Euphytica** 201 (3). DOI 10.1007/s10681-014-1333-8 (published online: http://download.springer.com/static/pdf/701/art%253A10.1007%252Fs10681-014-1333-8.pdf?auth66=1421077533_ee5333729aa3aa8581eb7d812c3c8a67&ext=.pdf)

Status: Published

Acknowledgement of Federal Support: Yes

Books or other non-periodical, one-time publications.

Ahmed ElFatih El Doliefy, Ph.D., graduated May 2015 (degree posted on 6/16/2015) and returned to Cairo to teach at University. His dissertation is Molecular Mapping of Fusarium head blight Resistance in Two Adapted Spring Wheat Cultivars.

Status: Published

Acknowledgement of Federal Support: Yes

Other publications, conference papers and presentations.

- Dr. Mergoum presented an invited talk at the Agronomy Seed Farm field day in July 2015. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different wheat lines.
Status: Presented
Acknowledgement of Federal Support: Not applicable for these presentations.
- Dr. Mergoum presented invited talks on wheat varieties in North Dakota to trade teams from the Philippines and Japan in August 2015. Presentation included discussions on the levels of resistance to FHB and DON accumulation of different wheat lines.
Status: Presented
Acknowledgement of Federal Support: Not applicable for these presentations.